



SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Dell Inc.

SPECrate®2017_fp_base = 41.6

PowerEdge R340 (Intel Xeon E-2288G, 3.70 GHz)

SPECrate®2017_fp_peak = 44.9

CPU2017 License: 55

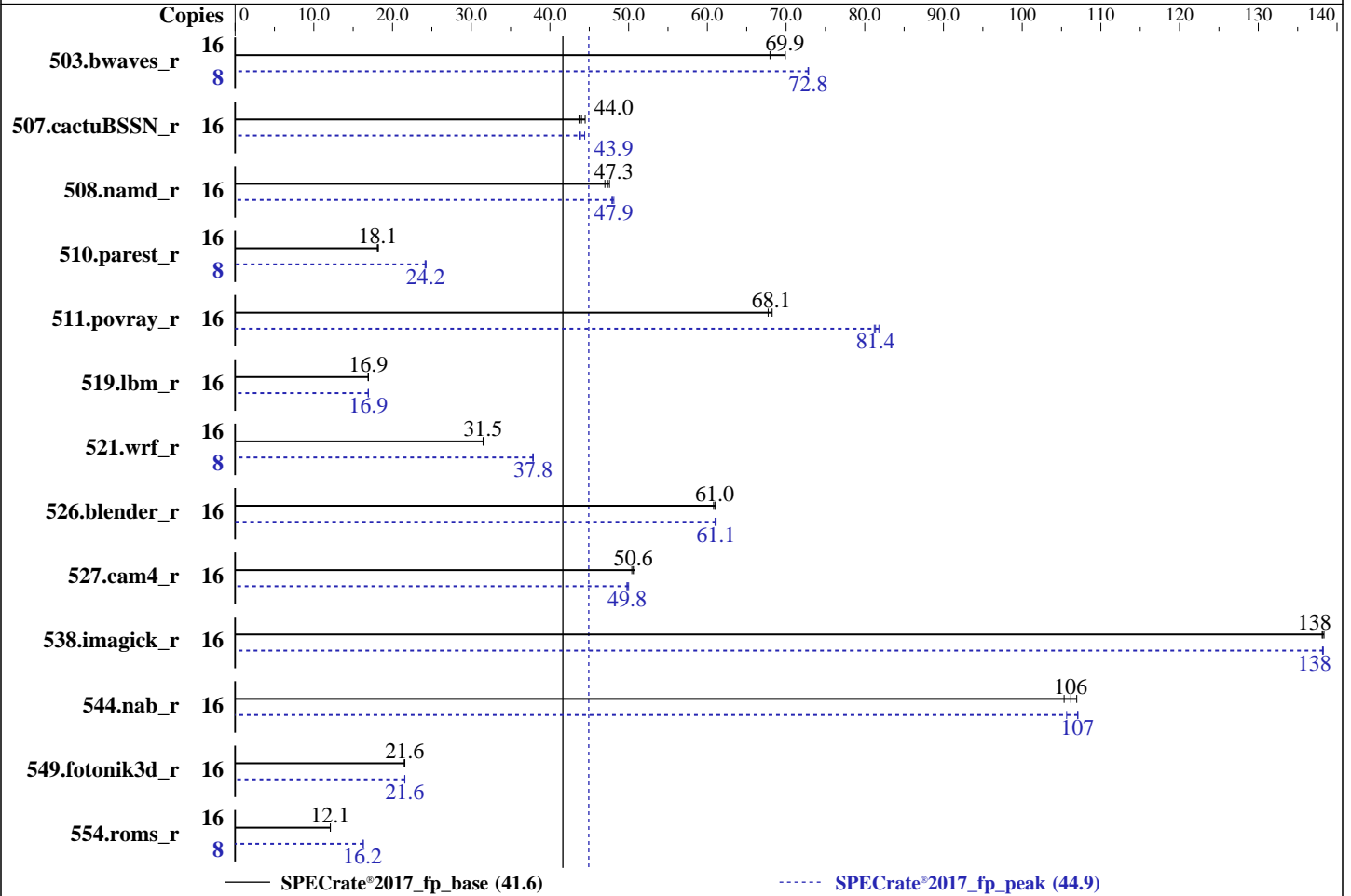
Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Nov-2019

Hardware Availability: Dec-2019

Software Availability: Jun-2019



Hardware

CPU Name: Intel Xeon E-2288G
 Max MHz: 5000
 Nominal: 3700
 Enabled: 16 cores, 1 chip
 Orderable: 1 chips
 Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 256 KB I+D on chip per core
 L3: 16 MB I+D on chip per chip
 Other: None
 Memory: 64 GB (4 x 16 GB 2Rx8 PC4-2666V-R)
 Storage: 1 x 960 GB SATA SSD
 Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP1 kernel 4.12.14-195-default
 Compiler: C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux;
 Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux
 Parallel: No
 Firmware: Version 2.1.6 released Nov-2019
 File System: xfs
 System State: Run level 3 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: 64-bit
 Other: None
 Power Management: BIOS set to prefer performance at the cost of additional power usage.



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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	16	2296	69.9	2361	68.0	2296	69.9	8	1102	72.8	1101	72.9	1101	72.8
507.cactuBSSN_r	16	455	44.5	464	43.7	460	44.0	16	462	43.9	456	44.4	463	43.7
508.namd_r	16	324	47.0	321	47.3	320	47.6	16	316	48.1	317	47.9	317	47.9
510.parest_r	16	2300	18.2	2307	18.1	2317	18.1	8	867	24.1	863	24.3	864	24.2
511.povray_r	16	548	68.2	548	68.1	552	67.7	16	459	81.4	460	81.2	457	81.8
519.lbm_r	16	996	16.9	996	16.9	997	16.9	16	997	16.9	996	16.9	996	16.9
521.wrf_r	16	1138	31.5	1137	31.5	1137	31.5	8	474	37.8	474	37.8	473	37.9
526.blender_r	16	399	61.0	401	60.8	400	61.0	16	399	61.1	399	61.1	400	61.0
527.cam4_r	16	555	50.4	553	50.6	551	50.8	16	562	49.8	560	50.0	562	49.8
538.imagick_r	16	288	138	288	138	288	138	16	288	138	288	138	288	138
544.nab_r	16	256	105	254	106	252	107	16	255	106	252	107	251	107
549.fotonik3d_r	16	2912	21.4	2893	21.6	2891	21.6	16	2892	21.6	2890	21.6	2893	21.6
554.roms_r	16	2100	12.1	2102	12.1	2102	12.1	8	785	16.2	780	16.3	788	16.1

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"

Environment Variables Notes

Environment variables set by runcpu before the start of the run:

LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64"

General Notes

Binaries compiled on a system with 1x Intel Core i9-799X CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5

NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

Yes: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1) is mitigated in the system as tested and documented.

Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2)

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General Notes (Continued)

is mitigated in the system as tested and documented.
 Transparent Huge Pages enabled by default
 Prior to runcpu invocation
 Filesystem page cache synced and cleared with:
`sync; echo 3> /proc/sys/vm/drop_caches`
 runcpu command invoked through numactl i.e.:
`numactl --interleave=all runcpu <etc>`

Platform Notes

BIOS settings:
 Virtualization Technology disabled
 DCU Streamer Prefetcher disabled
 System Profile set to Custom
 CPU Performance set to Maximum Performance
 C States set to Autonomous
 C1E disabled
 Uncore Frequency set to Dynamic
 Energy Efficiency Policy set to Performance
 Memory Patrol Scrub disabled
 Logical Processor disabled
 CPU Interconnect Bus Link Power Management enabled
 PCI ASPM L1 Link Power Management enabled

Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011
 running on linux-g3ob Thu Nov 14 18:13:03 2019

SUT (System Under Test) info as seen by some common utilities.
 For more information on this section, see
<https://www.spec.org/cpu2017/Docs/config.html#sysinfo>

From /proc/cpuinfo
 model name : Intel(R) Xeon(R) E-2288G CPU @ 3.70GHz
 1 "physical id"s (chips)
 16 "processors"
 cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
 cpu cores : 8
 siblings : 16
 physical 0: cores 0 1 2 3 4 5 6 7

From lscpu:
 Architecture: x86_64
 CPU op-mode(s): 32-bit, 64-bit
 Byte Order: Little Endian

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Platform Notes (Continued)

```

Address sizes:      39 bits physical, 48 bits virtual
CPU(s):            16
On-line CPU(s) list: 0-15
Thread(s) per core: 2
Core(s) per socket: 8
Socket(s):         1
NUMA node(s):     1
Vendor ID:         GenuineIntel
CPU family:        6
Model:             158
Model name:        Intel(R) Xeon(R) E-2288G CPU @ 3.70GHz
Stepping:          13
CPU MHz:           3700.000
BogoMIPS:          7392.00
Virtualization:    VT-x
L1d cache:         32K
L1i cache:         32K
L2 cache:          256K
L3 cache:          16384K
NUMA node0 CPU(s): 0-15
Flags:             fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer
aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single
ssbd ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase
tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm mpx rdseed adx smap clflushopt
intel_pt xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts md_clear flush_l1d
arch_capabilities

```

```

/proc/cpuinfo cache data
cache size : 16384 KB

```

```

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.

```

```

available: 1 nodes (0)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
node 0 size: 64131 MB
node 0 free: 62610 MB
node distances:
node    0
0:     10

```

```

From /proc/meminfo
MemTotal:      65670280 kB
HugePages_Total:      0

```

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Platform Notes (Continued)

Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*

os-release:

NAME="SLES"

VERSION="15-SP1"

VERSION_ID="15.1"

PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"

ID="sles"

ID_LIKE="suse"

ANSI_COLOR="0;32"

CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:

Linux linux-g3ob 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault): Not affected

Microarchitectural Data Sampling: Not affected

CVE-2017-5754 (Meltdown): Not affected

CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp

CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization

CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

run-level 3 Nov 14 10:22 last=5

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda2	xfs	440G	30G	411G	7%	/

From /sys/devices/virtual/dmi/id

BIOS: Dell Inc. 2.1.6 09/27/2018

Vendor: Dell Inc.

Product: PowerEdge R340

Product Family: PowerEdge

Additional information from dmidecode follows. WARNING: Use caution when you interpret this section. The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.

Memory:

2x 00CE00000A02 M391A2K43BB1-CTD 16 GB 2 rank 2666

2x 00CE00000A07 M391A2K43BB1-CTD 16 GB 2 rank 2666

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Platform Notes (Continued)

(End of data from sysinfo program)

Compiler Version Notes

```
=====
C | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
  | 544.nab_r(base, peak)
-----
```

```
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
-----
```

```
=====
C++ | 508.namd_r(base, peak) 510.parest_r(base, peak)
-----
```

```
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
-----
```

```
=====
C++, C | 511.povray_r(base, peak) 526.blender_r(base, peak)
-----
```

```
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
-----
```

```
=====
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
-----
```

```
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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-----
```

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Compiler Version Notes (Continued)

```

=====
Fortran          | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                  | 554.roms_r(base, peak)
=====

```

```

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
=====

```

```

=====
Fortran, C       | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
=====

```

```

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
=====

```

Base Compiler Invocation

C benchmarks:

```
icc -m64 -std=c11
```

C++ benchmarks:

```
icpc -m64
```

Fortran benchmarks:

```
ifort -m64
```

Benchmarks using both Fortran and C:

```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:

```
icpc -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:

```
icpc -m64 icc -m64 -std=c11 ifort -m64
```



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Base Portability Flags

```

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

```

Base Optimization Flags

C benchmarks:

```

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

```

C++ benchmarks:

```

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

```

Fortran benchmarks:

```

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

```

Benchmarks using both Fortran and C:

```

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

```

Benchmarks using both C and C++:

```

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

```

Benchmarks using Fortran, C, and C++:

```

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

```




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Peak Compiler Invocation

C benchmarks:

```
icc -m64 -std=c11
```

C++ benchmarks:

```
icpc -m64
```

Fortran benchmarks:

```
ifort -m64
```

Benchmarks using both Fortran and C:

```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:

```
icpc -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:

```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

```
519.lbm_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

```
538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4
```

544.nab_r: Same as 538.imagick_r

C++ benchmarks:

```
508.namd_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

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Peak Optimization Flags (Continued)

510.parest_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:

503.bwaves_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-lhs -align array32byte

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

Benchmarks using both Fortran and C:

-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

526.blender_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

Benchmarks using Fortran, C, and C++:

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/Intel-ic19.0ul-official-linux64.2019-07-09.html>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE7.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/Intel-ic19.0ul-official-linux64.2019-07-09.xml>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE7.xml>



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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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